

## Department of Statistical and Actuarial Sciences Mathematics of Financial Options (FM3613B)

### Course outline for Winter 2021



Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: <https://www.uwo.ca/health/>.

#### Technical Requirements and Important Dates:



Stable internet connection



Laptop or computer



Working microphone



Working webcam



Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
January 11	February 15 - 19	April 12	April 13	April 14 - 30

\* March 15, 2021: Last day to drop a second-term half course or a second-term full course without penalty

## 1. Course Information

#### Course information

Course Name: Mathematics of Financial Options (FM 3613B)

Lecture Hours: Monday, Wednesday, Friday 2:30 – 3:30 PM

#### List of Prerequisite(s)

SS2503A/B Applied Mathematics 2402A or the former Differential Equations 2402A; or Statistical Sciences 2503A/B (or the former Applied Mathematics 2503A/B). Applied Mathematics 2402A or the former Differential Equations 2402A; or Statistical Sciences 2503A/B (or the former Applied Mathematics 2503A/B).

#### List of Antirequisite(s)

The former Applied Mathematics 3613A/B

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This

decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

## 2. Instructor Information

Course Coordinator	Contact Information
Marcos Escobar-Anel	Marcos.escobar@uwo.ca



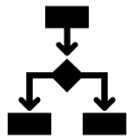
Instructor(s) or Teaching Assistant(s)	Contact Information
Marcos Escobar-Anel	Marcos.escobar@uwo.ca
Yuyang Cheng	yche259@uwo.ca

Office Hours	Zoom or MS Teams or in Person	Names
Wed 8-10 am	Zoom	M. Escobar-Anel

Students must use their Western (@uwo.ca) email addresses when contacting their instructors and indicate the course number (FM3613) in the subject line.

## 3. Course Syllabus, Schedule, and Delivery Mode

An introduction to modern financial mathematics using a differential equations approach. Stochastic differential equations and their related partial differential equations. The Fokker-Planck and Kolmogorov PDEs. No-arbitrage pricing, the Black-Scholes equation and its solutions. American options. Exotic options.



Type	Mode	Dates	Time	Frequency
Lecture	Synchronous online (Zoom)	M/W/F	2:30-3:30	weekly

Attendance at synchronous sessions is required

### Learning Outcomes

Upon successful completion of this course, students will be able to:

- Intuition about uncertainty and risk.
- The classical approach to decision making under uncertainty.
- Repaying loans over time.
- Bond pricing with default: using difference equations.
- Tranching and collateralized debt obligations.
- Modeling stock prices.
- Mean-variance portfolio optimization.
- Capital Asset Pricing Model.
- A qualitative introduction to options.
- Basic Stochastic Calculus.
- Solving the Black Scholes PDE.



## Table of Contents and Schedule



Week	Dates	Topic	Instructor
1	Jan 11 – 15	Probability, Risk and Uncertainty.	M. Escobar-Anel
2	Jan 18 – 22	Repaying loans over time, increasing payments	M. Escobar-Anel
3	Jan 25 – 29	Bond Pricing with Default.	M. Escobar-Anel
4	Feb 1 – 5	CDO and Tranching.	M. Escobar-Anel
5	Feb 8 – 12	CDO and Tranching. (Test 1)	M. Escobar-Anel
6	Feb 15 – 19	Reading Week	N/A
7	Feb 22 – 26	Modeling Stock Prices	M. Escobar-Anel
8	Mar 1 – 5	Mean Variance Portfolio.	M. Escobar-Anel
9	Mar 8 –12	Mean Variance Portfolio. (Test 2)	M. Escobar-Anel
10	Mar 15 – 19	Capital Asset Pricing Model.	M. Escobar-Anel
11	Mar 22 – 26	A Qualitative Introduction to Options (Test 3)	M. Escobar-Anel
12	Mar 29 – Apr 2	Basic Stochastic Calculus.	M. Escobar-Anel
13	Apr 5 – 9	Black-Scholes Formula.	M. Escobar-Anel
14	Apr 12	Final Exam preparation.	M. Escobar-Anel

## Online Participation and Engagement



- Students are expected to participate and engage with content as much as possible
- Students can post on OWL Forum their questions, answers, and have discussions with their peers, TA's, and the instructor.

## 4. Course Materials

Textbook (required): Quantitative Finance: A Simulation-Based Introduction Using Excel. Matt Davison. 978-1439871683

Supplemental: Instructor's course notes.

Students should check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.



All course material will be posted to OWL: <http://owl.uwo.ca>. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the [OWL Help page](#). Alternatively, they can contact the [Western Technology Services Helpdesk](#). They can be contacted by phone at 519-661-3800 or ext. 83800.

[Google Chrome](#) or [Mozilla Firefox](#) are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click [here](#).

## 5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Midterm Exam 1:	15 % (week of 8-12 February)
Midterm Exam 2:	15 % (week of 8-12 March)
Midterm Exam 3:	15 % (week of 22-26 March)
Final Exam	55 %

### Midterm Tests:

There will be 3 tests, each containing two parts, and all administered through OWL. Students will have 50 minutes to complete the test. Chapters and topics for the tests will be announced in advance through OWL.

Students shall upload their hand-written calculations/work in a single pdf file into their Dropbox folder on OWL within 10 minutes of completing each test.

### Final Exam:

The final exam will be a three-hour cumulative examination. It will be scheduled by the Registrar's office (Examination period April 14 to 30, 2021). Students shall upload their hand-written calculations/work in a single pdf file into their Dropbox folder on OWL within 30 minutes of the end-time of the final exam.

Click [here](#) for a detailed and comprehensive set of policies and regulations concerning examinations and grading.

## Accommodated Evaluations

- NO makeup test to either Midterm 1, Midterm 2, or Midterm 3. If you miss either test (with a valid reason), the weight of the test(s) will be moved to the remaining exams.
- If the make-up for the final is missed, the student will receive an INC and complete the task the next time the course is offered

## Rounding of Marks Statement

Across the Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. **Final grades** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

## 6. Accommodation and Accessibility

### Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological

and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

### **Academic Consideration for Student Absence**

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic Consideration for absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

and for the Student Medical Certificate (SMC), see:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

### **Religious Accommodation**

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see [http://www.registrar.uwo.ca/examinations/exam\\_schedule.html](http://www.registrar.uwo.ca/examinations/exam_schedule.html)).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See Academic Calendar for details (under [Special Examinations](#)).

## 7. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

### **Use of Electronic Devices.**

Students are allowed to use a non-programmable calculator on quizzes, midterms, and the final exam.

**Scholastic offences** are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

Tests and examinations in this course will be conducted using both Zoom and the remote proctoring service, such as Proctortrack.

When Zoom is used for exam invigilation, you will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session using Zoom will not be recorded.\*

Proctortrack will require you to provide personal information (including some biometric data). The session will be recorded. By taking this course, you are consenting to the use of this software.

More information about the use of Zoom for exam invigilation is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

More information about remote proctoring is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

Completion of this course will require you to have a reliable internet connection and a device that meets the system and technical requirements for both Zoom and Proctortrack. Information about the system and technical requirements are available at the following links:

<https://www.proctortrack.com/tech-requirements/>

<https://support.zoom.us/hc/en-us>

\* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination.

## Professionalism & Privacy

Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:



- Students are expected to follow online etiquette expectations provided on OWL
- All course materials created by the instructor(s) are copyrighted and cannot be sold/shared
- Recordings are not permitted (audio or video) without explicit permission
- Permitted recordings are not to be distributed
- Students will be expected to take an academic integrity pledge before some assessments
- All recorded sessions will remain within the course site or unlisted if streamed

## Copyright Statement

Please be aware that all course materials created by the instructor(s) are copyrighted and cannot be **sold/shared**. Those include materials used in tests/quizzes, midterms, and finals. Any posting/sharing of such materials in part or whole without owner's consent is considered as violation of the Copyright Act and will be considered as a scholastic offence.

In addition, online services such as Chegg are actively monitored. Any questions that are coming out during midterms and finals and are posted to an online service will be searched. Such an activity will be considered as a scholastic offence and will result in academic penalty.

## 8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western ([http://www.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_health)) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.